COLONY OF MAURITIUS

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DEPARTMENT OF AGRICULTURE

Sixteenth Annual Report of the Sugarcane Research Station 1945

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J. ELIEL FELIX, ACTING GOVERNMENT PRINTER,
PORT LOUIS, MAURITIUS, 1946.

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SUGARCANE RESEARCH STATION, MAURITIUS
16TH ANNUAL REPORT 1945

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Sixteenth Annual Report on the Sugarcane Research Station for the year 1945

INTRODUCTION

The year 1945 will go down to history as one of the most disastrous in the annals of the colony. Early in January the prospects were reasonably good, with the crop well advanced. Strenuous efforts were being made to replant in cane a proportion of the area previously used for food production, in spite of labour difficulties and a heavy weed infestation of the thrown out lands, which made the work difficult and expensive. On January 14–16 an exceptionally severe cyclone was experienced, the centre of which passed over the island from north to south. Tremendous damage was caused to plantations and buildings throughout the island—damage which was generally recognized as being appreciably greater than that sustained in the last great cyclone of 1892. A second cyclone on February 2–3 passed sufficiently close to the island to cause further widespread damage, while barely had the canes begun to show signs of recovery when on April 6–8 a third cyclone devastated the plantations again. Never previously in the history of the colony had three cyclones of such severity been experienced in so short a time. Full vegetative growth of canes was never resumed after the April cyclone, as little of the growing season remained. Actual measurements made on canes of M.134/32 at Réduit showed that an average of only 11·2 inches of growth were made per cane between 20th April and 10th August. Dry weather during the reaping season, particularly in the north, resulted in good ripening, and the final extraction figure of 11·1 was above expectations, but below normal. The island crop was 138,900 tons of sugar, the lowest since 1898. The area harvested is estimated at 107,234 acres, so that the yield of sugar per acre was approximately 1·3 tons, compared with the previous five-year average of almost 2·5 tons.

Some 65 per cent. of the area under cane in 1945 was planted in varieties produced by the Sugarcane Research Station. Had it not been for these varieties, there can be no doubt that the results of the crop would have been far more disastrous. M. 134/32 should be particularly mentioned in this respect. This variety is now the standard in all parts of the island, having given exceptional results over a number of years. No matter what its future status may be in comparison with newer varieties, it will always be remembered as the life-saver of the industry in 1945.

Rainfall figures for three stations, and temperature figures for Réduit, supplied by the Statistician, Department of Agriculture, were as follows—

1945 Months	Pamplemousses Experiment Station		Central Experiment Station, Réduit			Royal College, Curepipe	
	Rainfall		Rainfall		Temperature above (+) or below (−) normal ° C	Rainfall	
	Average Inches	1945 Inches	Average Inches	1945 Inches		Average Inches	1945 Inches
January ...	9·56	10·29	10·32	16·61	+0·4	16·33	32·43
February ...	8·74	4·88	10·95	7·93	−0·4	17·28	23·79
March ...	9·32	5·22	11·94	8·21	−0·1	19·31	19·79
April ...	5·96	9·01	5·41	13·15	+0·3	12·39	25·37
May ...	4·48	3·37	4·24	3·66	−0·1	9·86	6·27
June ...	3·43	1·56	3·11	1·90	−0·1	7·47	3·43
July ...	2·93	1·42	2·75	1·74	+0·2	8·57	8·47
August ...	2·59	1·64	2·47	3·85	+0·5	7·79	12·50
September ...	1·83	0·39	1·71	0·35	−0·1	5·78	1·58
October ...	1·95	2·87	1·91	2·72	+0·6	4·52	8·64
November ...	2·13	0·87	2·33	2·17	+0·2	5·71	4·06
December ...	4·91	4·47	6·37	4·58	+0·2	9·71	8·32
TOTAL ...	57·83	45·99	63·51	66·87		124·72	154·65

The research work carried out during the year was again limited by shortage of staff. Mr. N. Craig, Senior Chemist and Officer in charge of the Station, left the colony on leave on 27th March, after a period of more than eight years' continuous service, and had not returned by the end of the year. During his absence, the Geneticist acted as officer in charge of the Station. The Botanist, Dr. H. Evans, who had been seconded to the Information Office since 31st January, 1942, was released in August, 1945, but left the colony on 11th August on leave. Consequently, two of the three divisions of the Station were without their senior officer during the greater part of the year Mr. S. M. Feillafé was appointed temporary Scientific Assistant in the Botanical Division on 13th April. His work was mainly concerned with preliminary experiments on the control of noxious weeds in canefields by chemical methods and by flaming. It is hoped to extend greatly this aspect of the work of the Station, on the return of the Senior Chemist, who has had discussions on the modern methods of weed control with the authorities in England whilst on leave. Mr. M. Sooltangos was appointed temporary Assistant for Cultural and Manurial Experiments on 1st October.

The Senior Chemist, up to the time of his departure, continued to act as Assistant to the Director of Agriculture, and to administer the regulations concerning the distribution and sale of chemical fertilizers. The Geneticist continued his work on maize improvement throughout the year.

The Research Advisory Committee met in May, when questions of staff and future research work were considered, and the annual report for 1944 was discussed.

Plans for the opening of a third Experiment Station, to be situated in an area typical of the wet, cold, highland regions, were approved by Government during the year, and arrangements have been concluded with the Anglo-Ceylon and General Estates Co. Ltd., to lease a suitable area of land for the purpose. The Sugar Industry Reserve Fund and the Mauritius College of Agriculture have agreed to bear a similar proportion of the required additional recurrent expenditure to that which they contribute at present towards the cost of the Sugarcane Research Station. It is hoped that building work will be commenced shortly, and that the new Station will be opened in 1946. By allowing of the testing of varieties especially for the cold wet conditions, this Station should add materially to the value of our work for the industry.

Three new sugarcane varieties were released for general cultivation in September, and canes of these were distributed to growers in all districts of the island before the end of the year. A consignment of six of the most promising of the recent Barbados commercial varieties was received from Trinidad by air in October. Notes on the newly released varieties and the new importations are given in the Geneticist's section of this report.

Thanks are due not only to all members of the staff of the Station for their loyalty and unfailing support, but also to all those managers of estates and others of the planting community whose help and co-operation in many aspects of our field work has been so willingly given.

G. C. Stevenson,
Acting Officer-in-charge,
Sugarcane Research Station.

PART I—GENETICIST'S DIVISION

I. Cane Breeding—M./45 Series

The breeding work was carried out at the Central Experiment Station, Réduit, during the period May–July. The breeding plots had suffered considerable damage in the cyclones of January, February and April, and although conditions were favourable during the arrowing season, it was impossible to carry out a full crossing programme owing to scarcity of arrows in several required parent varieties. Nevertheless, forty-four crosses were made, and sufficient seedlings were raised from these to carry out satisfactory first year seedling trials both at Reduit and at Pamplemousses Experiment Stations.

Field plantations of the seedling populations were completed at both Stations before the end of December.

The following summary shows the extent of the breeding work, and the numbers of seedlings planted at each Station—

	No. of crosses made	No. of lanterns used	No. of seedlings obtained	No. of seedlings planted C.E.S.	No. of seedlings planted P.E.S.
1. Noble cane breeding *(S. officinarum)* ...	1	1	370	289	–
2. Nobilization of *S. spontaneum* (Java)					
(a) 3rd nobilization	1	1	0	–	–
(b) 4th nobilization	2	4	258	130	–
(c) 5th nobilization	4	8	775	504	154
(d) 6th nobilization	1	1	760	350	326
(e) mixed " glagah " cross	1	1	0	–	–
3. Nobilization of *S. spontaneum* (India)					
(a) 2nd nobilization	1	1	15	13	–
(b) 3rd nobilization	2	2	0	–	–
4. Nobilization of *S. robustum*					
(a) 2nd nobilization	1	1	3,000	455	697
5. Crosses involving several *Saccharum* spp.					
(a) S. officinarum, S. spontaneum (Java) and *S. spontaneum* (India)	19	33	4,894	2,821	1,200
(b) S. officinarum, S. spontaneum (India) and *S. barberi*	1	2	300	287	–
(c) S. officinarum, S. spontaneum (India) and *S. spontaneum* (Celebes)	1	1	0	–	–
(d) S. officinarum, S. spontaneum (Java), and *S. robustum*	2	2	667	321	135
(e) S. officinarum, S. spontaneum (Java) *S. spontaneum* (India) and *S. barberi*	3	4	46	42	–
(f) S. officinarum, S .spontaneum (Java), *S. spontaneum* (India) and *S. sinense*	2	2	770	459	267
(g) S. officinarum, S. spontaneum (Java), *S. spontaneum* (India) and *S. robustum*	1	1	300	258	–
6. Intergeneric cross—sugarcane by sweet sorghum	1	2	11	9	–
TOTALS ...	44	67	12,166	5,938	2,779

It will be noted that purely noble cane breeding and direct nobilization crosses assumed less importance in the breeding programme than was the case in previous years, while complex crosses involving derivatives of the noble canes and both the Javan and Indian *Spontaneum* forms predominated. Experience with seedlings from this breeding line has revealed it to be of outstanding merit as regards the production of potential commercial varieties, and there is little doubt that seedlings of this type will be the estate varieties of the near future. Moreover, certain of these varieties show considerable promise as parents, and in experimental crosses are being used in combination with derivatives of *S. barberi* and *S. robustum* to breed seedling populations of highly complex genealogy and of notable inherent vigour and quality.

Attention is again directed to the excellent germination of seedling populations from the *S. robustum* crosses—even where this species was used in combination with two or more other *Saccharum* types. Direct nobilization of *S. robustum* does not appear a promising line of breeding for Mauritius conditions, but an infusion of this blood into the poly-species breeding lines referred to above should yield valuable types.

There was no important change in the methods of breeding and seedling raising: the use of the small arrow-lantern with male arrows in sulphurous acid solution yields adequate seedling populations with the minimum of labour and expense, while planting in steam-sterilized soil precludes losses in the box stage.

Seedlings were planted in blocks, as usual, but in addition randomized plantations were again made in order to test statistically the merits of certain populations in comparison with the clonal material of M. 134/32 and M. 112/34 at both Experimental Stations.

II. First Year Trials

(a) Virgins—M./44 Series. As explained in previous reports, virgin seedling selections are now made only at Pamplemousses Experiment Station, where conditions are favourable for a short-season crop. At Réduit the seedlings were cut early in the harvesting season and left for selection in ratoons. At Pamplemousses, selections were made in November, and 76 seedlings were selected from the population of 4,965, or approximately 1·5 per cent.

*(b) Ratoons—*M./43 Series. Ratoon selections were made at both Stations: at Réduit, 63 seedlings were selected from a population of 6,966, or approximately 0·9 per cent., and at Pamplemousses the corresponding figures were 51 from 5,099, or approximately 1·0 per cent.

The cyclones had caused considerable damage in seedling plantations, resulting in breakage of canes, stunting of growth, and much secondary red rot disease development in susceptible individuals. Consequently, selection standards were of necessity somewhat below those of previous years, but there is every reason to believe that seedlings selected after growth during the hard conditions of the 1945 season should be of a high calibre.

The special randomized plantation to test the merits of seedling populations from certain crosses in comparison with that of clonal material of M.134/32 grown from single-eye cuttings was reaped at Pamplemousses Experiment Station. Data were taken for weights, cane numbers, and refractometric brix values of each stool, and these have been analysed statistically. There were one hundred seedlings from each of nine crosses and one hundred stools of M.134/32. Variation in the seedling populations is both *genotypic* and *environmental*, whereas that in the M.134/32 material is *environmental* only, as the stools are of a single fixed genotype. Coefficients of variability for the M.134/32 should therefore give an index of the extent of environmental variability characteristic of the piece of land used, though this index refers only to the particular season's conditions. As the plantation was a random one, it is evident that the more is the coefficient of variability of a seedling population in excess of that of the clonal M.134/32 material, the greater is the degree of *genotypic* variation associated with that population, and it is upon selections based on *genotypic* variation that the plant breeder depends for varietal improvement.

The means of the populations under reference—for weight, number of canes, and brix—together with the corresponding coefficients of variability (V) are given in the following table—

Population	*Weight (Kgs.)*		*Cane Number*		*Ref. Brix*	
	Mean	*V*	*Mean*	*V*	*Mean*	*V*
Co. 281 × M. 63/39	8·23 ± 0·51	59·5	10·50 ± 0·52	47·6	21·38 ± 0·10	4·6
M. 112/34 × M. 99/34	7·53 ± 0·32	42·1	7·88 ± 0·26	32·4	21·14 ± 0 13	6·1
M. 134/32 × M. 341/40	5·95 ± 0·28	47·2	8·66 ± 0·38	43·2	20·81 ± 0 15	7·3
M. 112/34 × M. 76/39	5·83 ± 0·23	39·8	7·03 ± 0·24	33·6	21·75 ± 0·10	4·5
M. 134/32 clonal	5·31 ± 0·21	39·9	6·35 ± 0·19	29·4	21·91 ± 0·14	6·5
Co. 281 × P.O.J. 2878	4·55 ± 0·32	64·8	7·42 ± 0·42	51·3	22·19 ± 0·27	11·3
M. 112/34 × M. 27/16	4·29 ± 0·23	51·5	5·69 ± 0·26	44·1	21·80 ± 0·14	6·5
M. 144/42 × M. 27/16	3·38 ± 0·20	57·4	5·48 ± 0·28	49·3	21·20 ± 0·08	3·7
M. 112/34 × M. 72/31	3·38 ± 0·19	53·8	5·08 ± 0·24	45·5	22·22 ± 0·15	6·5
55P × P.O.J. 2878	2·31 ± 0·18	58·0	3·91 ± 0·25	48·6	21·39 ± 0·16	5·8

The populations are listed in the order of mean weight per stool. Four populations were better than M.134/32 in this respect, and it is significant to note that all these are from complicated crosses involving three or more *Saccharum* types—crosses whose excellence has been referred to above. Moreover, the majority of seedling selections made from this experiment for further testing were from these four crosses. This indicates the value of progeny testing studies, and illustrates the principle that the higher is the general average of a population, the better is the chance of superior individuals occurring in the tail of its distribution curve.

The relatively low values for coefficients of variability in refractometric brix, and the fact that several seedling populations show lower values than does M.134/32, will at once be noticed. These facts serve to give statistical backing to generally appreciated view that juice quality, considererd purely as a basis of seedling comparison, is a reliable criterion of selection.

It is not proposed, at the present stage, to pursue further the implications of the above data: more information will become available from the experiments already laid down, and it is hoped later to treat the whole subject fully in a separate publication.

III. Second Year Trials

At Réduit, eleven trials were planted in March–April in the series testing the M./41 seedlings from ratoon selections. At Pamplemousses, six trials were planted in July–August—three included the M./42 series seedlings selected from ratoons, and three the M./43 series virgin selections. At both stations the new trials made satisfactory growth in the favourable conditions experienced before the end of the year.

During the crop season, eleven second year trials were cut at Réduit, and from these fourteen selections were made for further testing in third year trials. At Pamplemousses, seven trials were cut, and from these sixteen selections were made—ten from trials including M./41 series seedlings originally selected from ratoons, and six from the M./42 series of virgin selections. All selections from second year trials were planted in multiplication plots to provide planting material for the series of third year trials in 1946.

Cane yield and richness of juice are the most important features to be recorded in seedling trials. In addition to these, such ancillary characters as cane numbers, extent of arrowing and the occurrence of diseases are recorded in the series of second year trials, in order that selection at this stage may be precise.

IV. Third Year Trials

At Réduit, two third year trials were cut in October. These had suffered severely in the cyclones and made poor growth, giving very low yields. Two varieties, M.5/38 (M.171/30 × S.C. 12/4) and M.47/38 (M.134/32

× M.196/31) were sufficiently promising to be retained for further observation under more normal conditions. Both gave better yields than the standard varieties, and showed excellent juice quality.

At Pamplemousses, two third year trials were cut in October. From these, four varieties were selected, namely M.171/40 and M.204/40 (both from Ba. 11569 × M.72/31) and M.213/40 and M.233/40 (both from M.134/32 × M.99/34). These will be allocated to variety trials on estates for testing under various climatic conditions.

Three new third year trials were planted at Pamplemousses in July. In these, eighteen seedlings of the M./40 and M./41 series are being tested. Five seedlings of the M./40 series are the first of those selected from ratoon populations to reach the third year trial stage, and they include some very promising individuals.

There was no change in the methods used for laying out and for harvesting and analysing the third year trial plots. Surveys during the growing season were made in order to record the extent of disease development in the plots, as in previous years.

V. Variety Trials

Reference has been made in the introductory section of this report to the widespread damage caused by the three cyclones of 1945, and to the consequent serious reduction in cane yields. Such a reduction in yields need not of itself have affected the variety testing work were it not for the differential response between varieties which became apparent under the peculiar conditions of growth, and for which allowance had to be made in interpreting the variety trial results. It may be observed, for instance, that variety plots which were the most advanced in growth at the time of a cyclone suffered more than those less well developed. They were also slower to recover from the effects of the cyclones. Also, at one estate, two varieties which showed remarkable development at the time of a particularly severe borer attack were at a disadvantage in comparison with others which had made less cane per stool. Moreover, this disadvantage persisted throughout the growth period, and was reflected in the relatively low juice purities of these varieties at the crop season. For these and other reasons, unsupported numerical data obtained at the time of reaping the trials might have been misleading in many cases.

The series of variety trials gave the first comprehensive information on the performance of the new varieties M.165/38, M.63/39 and M.76/39 under various environmental conditions, and although these results were obtained in so abnormal a year, they were, when taken in conjunction with those obtained previously in trials on the Experiment Stations, considered to be so satisfactory that these three varieties were released for general propagation.

The results of the trials concerned with these three varieties are presented in the following table—

Trial	M. 165/38			M. 63/39			M. 76/39			M. 134/32		
	Tons cane per arpent	*Sucrose % cane*	*Tons sucrose per arpent*	*Tons cane per arpent*	*Sucrose % cane*	*Tons sucrose per arpent*	*Tons cane per arpent*	*Sucrose % cane*	*Tons sucrose per arpent*	*Tons cane per arpent*	*Sucrose % cane*	*Tons sucrose per arpent*
Pamplemousses Experiment Station *	27·7	14·19	3·93	27·3	13·52	3·69	25·1	13·65	3·42	21·9	13·92	3·04
Terracine *	–	–	–	36·0	14·72	5·30	41·6	14·92	6·21	21 2	16·17	3·43
Rivière des Anguilles † ...	29·6	11·86	3·51	26·5	11·71	3·10	29·6	13·95	4·13	21·5	14·80	3·15
Constance †	42·5	14·76	6·27	38·0	12·70	4·82	34·6	14·12	4·88	34·2	14·76	5·04
Rich Fund †	29·9	13·36	3·99	30·1	13·09	3·94	29·3	11·69	3·42	23·1	13·62	3·15
Alma †	–	–	–	21·7	11·87	2·57	19 2	12·99	2·49	13·7	14·23	1·95
Valetta †	12·9	11·75	1·52	13·6	11·63	1·58	8·1	11·86	0·96	7·9	13·33	1·05
Mon Désert †	–	–	–	27·1	12·80	3·47	19 6	11·35	2·22	17·4	12·70	2·21

* 1st. ratoons.
† virgins.

Figures for the standard variety M.134/32 were available for each trial, and are inserted in the above table for comparison with those of the newer varieties. The results show that all three varieties have been generally far superior to M.134/32 in cane yields and in sugar production per arpent. In juice quality, it is noticeable that M.63/39 and M.76/39 were appreciably inferior to M.134/32. Further notes on the characteristics of these varieties are given in section VI.

The trial at Valetta was poorly developed due to *petite saison* growth under conditions of the cold, high district. It was not allowed to stand over, however, as it was considered more advisable to secure information on ratooning in 1946, and also because material of the new varieties was required for propagation.

Certain other variety trials were reaped in ratoons: the results of these cannot be given on account of the necessity for economy in space. Their results served to corroborate the information already published concerning M.112/34—namely that this variety is by no means a general-purpose one. It is best suited to good soils where there is ample rainfall or irrigation water in or near the coastal belts, and is quite unsuited to the dry regions of the north or the high, cold central districts. Its juice quality was again shown to be outstanding.

Four new variety trials were planted during the year. These were designed to test the newly released varieties under a wider range of environmental conditions, including the dry unirrigated district in the north, where their behaviour is not yet known. Propagation plots were also established on certain estates to provide planting material for future variety trials.

VI. Release of New Varieties

The three varieties M.165/38, M.63/39 and M.76/39 were released in September, and there were heavy demands for planting material. Canes cut from propagation plots at Réduit and Pamplemousses, and also a proportion of those reaped in certain variety trials (by kind collaboration of the estate managers) were used for distribution, and by the end of the year a total of more than 13,000 canes of these varieties had been distributed to applicants in all districts of the island. Large propagation plots were also established at the Experiment Stations to provide material for distribution in 1946.

The salient characteristics of the new varieties are given in the following short notes:

M.165/38.—Parentage M.134/32 × M.196/31, the latter being from P.O.J. 2878 × Uba Marot. Germination generally good, but some cases of poor germination indicate the advisability of treating cuttings with a fungicidal solution before planting. Early growth oblique, high tillering, strong growing. Leaves medium width; canes long-joined, pinkish to brown; little arrowing. High yield of cane, good juice quality. Excellent results in all trials yet reaped. Resistant to gumming disease and red rot.

M.63/39.—Parentage M.134/32 × M.99/34, the latter being from M.109/26 × Uba Marot. Excellent germination, early tillering, covering the ground well to suppress weeds, strong growing. Leaves broad and healthy, canes pinkish with some wax bloom ; arrowing similar in extent to that of M.134/32. Cane yields very heavy. Juice quality appreciably lower than M.134/32, but sugar-per-arpent returns generally considerably higher. Resistant to gumming disease and red rot.

M.76/39.—Parentage M.134/32 × M.99/34, from the same cross as M.63/39. Germination and early growth excellent, giving good ground cover. Leaves broad and dark green ; they may develop a characteristic purplish tinge following leaf-spotting in the winter months at high altitudes: this condition is harmless. Canes deep purple with heavy wax bloom: arrowing probably similar to that in M.134/32. Cane yields and sugar-per-arpent returns usually higher than those of M.134/32, but juice quality generally somewhat lower. Best results up to the present have been given in the lower, warmer districts. Resistant to gumming disease and red rot.

The release of these three varieties signifies that they are considered worthy of extended trial under commercial conditions. There is little doubt that they will generally outyield the standard variety M.134/32 in actual sugar per arpent, while showing at the same time a considerably higher degree of resistance to red rot disease. The vigour of growth should also be of considerable value in allowing of good early ground covering to control weeds. The latter aspect is an important one at the present time of high labour costs and when extensive areas of land previously devoted to food production are reverting to cane growing.

The results of further variety trials must be awaited before recommendation can be issued with regard to the climatic regions of the island to which each of the new varieties is best suited. Similarly, their factory qualities will only be ascertained when considerable quantities are available for crushing.

VII. Disease Resistance Testing

Seedlings selected from second year trials were planted in the gumming disease resistance trial, as in previous years, so that at the time of reaping third year trials the resistance status of all individuals is known.

Unfortunately it was not possible to resume the investigational work on red rot resistance which was interrupted on account of war conditions and consequent shortage of staff. It is hoped, however, that this important line of work will be started shortly, in co-operation with the Plant Pathologist, Department of Agriculture. The season was one which was characterized by considerable development of red rot in susceptible varieties, partly following damage caused to canes in the cyclones, and partly following extensive attacks by borers in many districts. The standard estate variety M.134/32 showed a degree of red rot development which had not been seen in previous years, and which was the cause of anxiety on some estates. It is impossible without further experience to say definitely to what extent this degree of red rot appearance was a direct result of the cyclone damage, or an indirect one due to disturbance of the physiological balance of the canes on account of the

abnormal seasonal conditions. However that may be, it is possible from the results of direct observation in trials during the year to state that the three newly released varieties show considerably higher resistance to the disease than does M.134/32. In most of the trials M.134/32 showed appreciable attacks, whilst the new varieties were free.

In second year and third year trials there was sufficient natural infection by red rot to allow of reliable assessments of susceptibility to this disease, and several otherwise promising seedlings were rejected on account of red rot development.

VIII. Export of Fuzz

Fuzz from seven crosses was sent to the Director of the Experiment Station of the South African Sugar Association at Mount Edgecombe, and correspondence was exchanged regarding the performance of seedlings raised from previous consignments. Owing to the limitation of the breeding programme on account of cyclone damage, it was impossible to reserve fuzz for the Ministry of Agriculture, Egypt.

IX. Importation of West Indian Varieties

Six sugarcane varieties were received from Trinidad, British West Indies, in October, and were planted in a specially prepared quarantine greenhouse at Réduit. Air transport for the cuttings, *via* Accra and Nairobi, was made available through the courtesy of the Royal Air Force and the British Overseas Airways Corporation, whose valuable assistance is gratefully acknowledged.

The importation of certain West Indian varieties was considered in 1939, but with the onset of war, and the consequent difficulties in means of transport the project had to be abandoned.

The varieties which have been received are as follows:

B.3337, B.3439, B.34104, B.37161, B.37172 and B.4098. All were bred at the British West Indies Central Sugarcane Breeding Station, Barbados, and certain of them are now standard estate varieties in several of the West Indian colonies, where they are yielding considerably in excess of the varieties previously grown. After undergoing a period of quarantine, these varieties will be tested under estate conditions in Mauritius, and will be made available for commercial growing if they prove suitable.

As breeding canes, the consignment is of particular value, because it includes material from some potentially useful lines which were not hitherto represented in Mauritius.

X. Maize Improvement Work

Development of the three distinct selected strains of local yellow maize was continued, and these reached a stage of uniformity sufficient for their continued propagation by bulk selection methods.

Pure lines isolated by continuous selfing for five generations resulted in pure-breeding types characterised by great differences in many vegetative features. Several lines were discarded on account of major defects which

became evident in the third and fourth generations of selfing. The remaining lines were inter-crossed artificially to give hybrids of remarkable vigour and uniformity. These hybrids were again artificially crossed to produce " 4-way crosses " for testing. It is doubtful whether the work involved in maintaining the pure lines for artificial production of hybrid seed each year would be justified, considering the small demand for seed at present. Consequently it is the intention to combine the best of the lines by controlled crossing and back-crossing of " 4-way crosses " in an attempt to evolve a highly productive synthetic variety which will breed true under ordinary commercial conditions.

A variety of white field maize was developed from segregates of back-crosses from the imported white variety Synthetic Anveld and selected yellow maize. It is hoped that this variety will, after further selection, combine the vigour and high yield of the selected local maize with white seed colour.

G. C. Stevenson,
Geneticist.

PART II—CHEMISTRY

Long-range 3N × 3P × 3K factorial field trials:

Starting a new series of long range field trials with nitrogenous, phosphatic and potassic fertilizers constitutes the main effort of this division during the year under review. Nineteen trials following the standard 3 × 3 × 3 layout have been already planted, the variety chosen in each case being the well known M.134/32 cane.

This series of field trials will furnish valuable data on plant, soil, climate and fertilizer relationships, thus allowing for the keeping of a permanent check on the key of interpretation of foliar diagnosis as well as for the elaboration of a scale of fertility based on the newest methods of soil analysis.

M. E. M. d'Unienville, field assistant in charge of cultural methods, has been most helpful in connection with the above-mentioned trials.

New comparative index of vegetative growth:

An index of vegetative growth in fertilizer experiments has been worked out ; it consists in the weighing of thirty leaves of third rank taken at random from each plot at the time of maximum summer growth. This comparative index when fully developed will be of great use to experimentation, as its relative accuracy excels that of the actual weighing of canes at harvest time, as shown in the results given in table I expressed as percentage of the general averages for cane yields and for weight of one leaf.

TABLE I

		Trial 1–44		Trial 2–44	
		Cane Yield	Wt. of one leaf	Cane Yield	Wt. of one leaf
Linear Response	N	+ 2·4	+7·7	+10·0	+12·4
	P	+ 1·0	0·0	− 4·0	+ 2·5
	K	+ 6·7	+0·7	+ 5·5	+ 0·2
Sig. diff. P. 0·05		±11·1	±5·5	± 9·0	± 3·9
Curvature	N	− 7·2	−4·3	− 7·0	− 9·1
	P	+ 7·7	+5·7	−15·0	− 0·8
	K	− 2·9	+2·1	+ 4·5	+ 2·5
Sig. diff. P. 0·05		±19·3	±9·6	±15·0	± 6·7
Linear Interaction	NP	+ 2·9	−2·5	+ 2·5	+ 3·7
	NK	+ 2·9	+3·1	+ 2·0	− 1·3
	PK	− 9·6	−0·7	+ 1·0	+ 0·5
Sig. diff. P. 0·05		±12·5	±6·8	±11·0	± 4·7

Laterisation and the Silica content of the sugar cane plant:

Silica was determined on the different organs of M.134 '32 ratoon canes already collected and analysed last year to complete our data on the chemical composition of the cane plant. The results given in table II as SiO_2 per cent. dry matter and in Kgs. SiO_2 per arpent show large differences for canes grown in the three main climatic regions of the island. Laterisation or leaching of silica from the soil having been proved by previous studies to increase with rainfall, it is not surprising that the cane should confirm this relationship. These findings may renew the debated question of the usefulness of fertilization with silicates, powdered basalt, etc.

TABLE II

Climate	Millable cane (a)	Trash (b)	Prepared fodder (c)	Outer green leaves (d)	Entire green top (c+d)	Harvested cane plant (a+b+c+d)
			SiO_2% DRY MATTER			
Sub-humid (Six Estates)	1·02	7·92	5·50	2·02	3·99	3·16
Humid (Six Estates)	0·74	5·78	4·36	1·72	3·14	2·18
Super-humid (Six Estates)	0·68	5·46	3·46	1·56	2·62	2·15
			KGS. SiO_2 PER ARPENT			
	(a)	(b)	(c)	(d)	(c+d)	(a+b+c+d)
Sub-humid (Six Estates)	72	223	62	17	79	374
Humid (Six Estates)	55	144	44	15	59	258
Super-humid (Six Estates)	44	141	36	13	49	234

Foliar diagnosis through improved leaf punch technique :

Up to now, all data published by the Station on foliar diagnosis of sugar cane has been based on the analysis of the entire blade of the 3rd leaf, involving an expert and laborious preparation of the sample incompatible with the mass sampling by the sugar planters themselves, required for the working out of a practical scheme of biochemical control of the fertilizer requirements of sugarcane. Leaf punch technique when properly organized is ideal, as it allows the collecting of minute amounts of homogeneous leaf material sufficient for the rapid and inexpensive micro-chemical methods which are now available. Of course, the key of interpretation, i.e., the optimum N, P and K contents already published, will have to be altered accordingly before the actual starting of the projected biochemical control through foliar diagnosis.

The equipment for the improved sampling is inexpensive and can be easily handled by any planter. It consists of three different parts : (i) a small piece of wood carrying on a rubber base two nails about 3 inches apart, to receive a suitable number (twenty) of blades packed one over the other, (ii) a leaf punch made of an empty cartridge shell collecting in one operation the 7mm. diameter punches required and (iii) a wooden box with ten numbered one-inch holes to hold the leaf punches up to the time of starting the micro-chemical analysis.

Early Crop estimation by weighing :

Random weighing of canes on a sufficient number of very small areas to estimate the standing crop of large areas was made at our instigation by the Managers of Alma and Bénarès Sugar Estates. For the estimation on an estate of say 1,000 arpents, 10 feet length of row of cane was reaped from each 10 arpents of standing crop and the hundred samples thus collected were bulked into one or two lorries and weighed accurately. The results have been quite encouraging and it is expected that a number of managers will try this direct method of crop evaluation at the end of the cyclone season.

P. Halais,
Scientific Assistant.

PART III—RESEARCH BOTANY

Mr. Feillafé was released from the Army on the 12th of April and on his return was appointed acting scientific assistant of the division. As no work was on hand, he was directed to help in the other divisions until the time chemicals were received for weed eradication experiments. He was also responsible for the analysis of cane samples from field and variety trials until 1st October, when Mr. Sooltangos was appointed for this work.

Experiments on Estates

An investigation on the rate of growth of sugar cane under different climatic conditions of the island has been started. This work consists of cutting small areas of cane at monthly intervals from certain selected fields on twelve estates typical of the different climatic and soil conditions prevailing in the island. The different parts of the aerial portion of the cane plant were weighed and sampled for subsequent analysis. From the results obtained it is hoped to be able not only to follow the course of growth throughout the growth cycle but also to follow the intake of nutrients from the soil.

Weed eradication experiments

Some promising results have been obtained from experiments conducted in connection with the weed problem.

Due to the late arrival of the chemicals, only a limited amount of experiments has been carried out and each of the list of the most noxious weeds, already published in a previous report, tested with different concentrations of the chemicals available, with the exception of *herbe d'Argent (Ischæmum aristatum)* which is not very widely spread in cane fields.

The weed-killers tested included Copper chloride, Di-nitro-ortho-cresol (D.N.O.C.), the sodium salt of D.N.O.C., this last salt activated with Sulphate of ammonia and finally Sodium chlorate.

Copper chloride, D.N.O.C. and the derivatives of D.N.O.C. have been successful in controlling a certain number of annual weeds, but failed to eradicate deep rooted perennials. They are strictly contact weed-killers and are highly selective.

On the other hand, sodium chlorate proved to be the weed-killer *par excellence*, but a certain sterilizing effect on soil usually follows after an application of sodium chlorate. Experiments are being started to see the most convenient concentration to be used in cane fields in order to minimize its bad effects on canes. Further a certain compound (HSPA activator), patented in Hawaii, which, when added to sodium chlorate, enables this weed killer to be used with great success at a much lower concentration, is being ordered. At this low concentration no bad effects on canes have been noted in Hawaii, where sodium chlorate is used extensively. As stated in last year's report, the possibility of flaming has also been considered. A flame projector was built locally and after trials, which were not very satisfactory, was sent back to the Railway workshop at Plaine Lauzun for some modifications.

S. M. Feillafé,
Ag. Scientific Assistant.

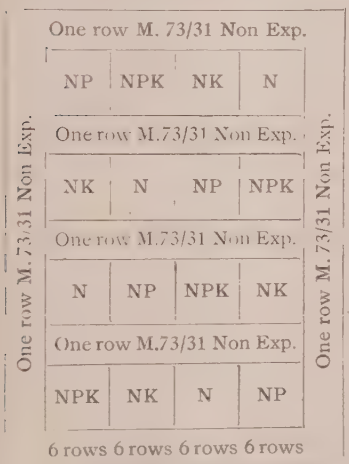
PART IV—REPORT OF THE FIELD ASSISTANT IN CHARGE OF CULTURAL METHODS

The work performed during 1945 was the following:

(1) The soil survey of the district of Black River, giving the area cultivated with sugarcane by estates with mill, big and small planters.

(2) Visits to small planters in all the districts in connection with improved cultural methods comprising appropriate time of planting, manurial treatment, choice of the best suitable variety in the different regions, etc., and propaganda for the three new released M varieties. Three manurial experiments (N.P.K.) as per plan below planted with M.134/32 have been laid down, one at Savanne, Grand Bois Co-operative Credit Society, one at Mont Ida, Flacq, and one at Beau Vallon, Camp de Masque Co-operative Credit Society, Flacq, and four other similar trials are to be planted during the coming season ; two in the North, one in Moka and one in Plaines Wilhems.

The object of the experiments, which will be controlled over several years and even over two rotations, is to determine the contents of plant food in the soil by leaf analyses and then appropriate an economical fertilizer programme for the different regions.



FERTILIZER PROGRAMME

Plots	*At Plantation*			*Approx. 3 months later*
	N/S	G.P.	M.P.	S/A
N	50 Ks/A	O	O	100 Ks/A
NP	50 Ks/A	200 Ks/A	O	100 Ks/A
NK	50 Ks/A	O	100 Ks/A	100 Ks/A
NPK	50 Ks/A	200 Ks/A	100 Ks/A	100 Ks/A

Pen Manure to be applied on interlines :
Area of Plot = 0·50 arpent.

N/S = Nitrate of Soda
G.P. = Guano Phosphate
M.P. = Muriate of Potash
S/A = Sulphate of Ammonia.

In general, the present usual cultural methods adopted so far by small planters may be classified into two categories, viz., planters who follow Estates' standard cultivation and those who follow a method which is far too inferior to normal standard cultivation.

Planters belonging to the second category have received most attention, and much advice has been given to them. Many have already put such advice into practice.

I have also extensively assisted Mr. Halais in his research work with respect to Field Experiments and Foliar Diagnosis on Sugar Estates.

As in previous years, I have assisted in work pertaining to Chemical Fertilizer Control in connection with cane growers and the Allotment Card issue.

E. M. D'UNIENVILLE,
Field Assistant, i/c Cultural Methods.